Chapter 2

Water Resources

WATER RESOURCES

RIVERS AND STREAMS

Indicator 1. Water Quality of Rivers and Streams

Background Kentuckians enjoy the benefits of an estimated 89,431 miles of rivers and streams. The quality of these waterways varies from severely degraded to clean enough for swimming, fishing or use as a drinking water source. The Kentucky Division of Water maintains a network of ambient water quality stations throughout the state to monitor water quality.[1] In 1997, 1998 and 1999, these stations monitored 8.4 percent of the 89,431 stream and river miles for 32 different parameters. While this data may not represent a statistically valid sample of water quality statewide, it does provide a general indicator of water quality in Kentucky.

Agricultural activities are the leading source of water pollution in monitored waterways based on the most recent and available monitoring data. Contaminated runoff containing agricultural nutrients and chemicals is impacting 25 percent of the monitored impaired stream miles. Resource extraction (coal mining and petroleum activities), follows impacting 15 percent of the miles impaired, while sewage treatment plants are impairing 13 percent of the monitored waterways.

Disease-carrying pathogens, often associated with untreated or poorly treated animal and human waste, remain the principal pollutant, impairing 31 percent of the stream miles monitored. In 1999, the state declared that 234 miles of Kentucky's rivers and streams were too polluted for swimming because of high levels of fecal coliform bacteria

Goal Safeguard from pollution the uncontaminated waters of the Commonwealth; prevent the creation of any new pollution of the waters of the Commonwealth; and abate any existing pollution per KRS 224.70-100.

Progress State, local and private sector efforts to restore water quality have been ongoing since the passage of the federal Clean Water Act in 1972. During the past 25 years, progress has been made in improving water quality in the state. For example, in 1972, 71 percent of the waterways could not fully support their designated uses, compared to 34 percent in 1997-1999.

At a Glance

River and stream miles. 89,431

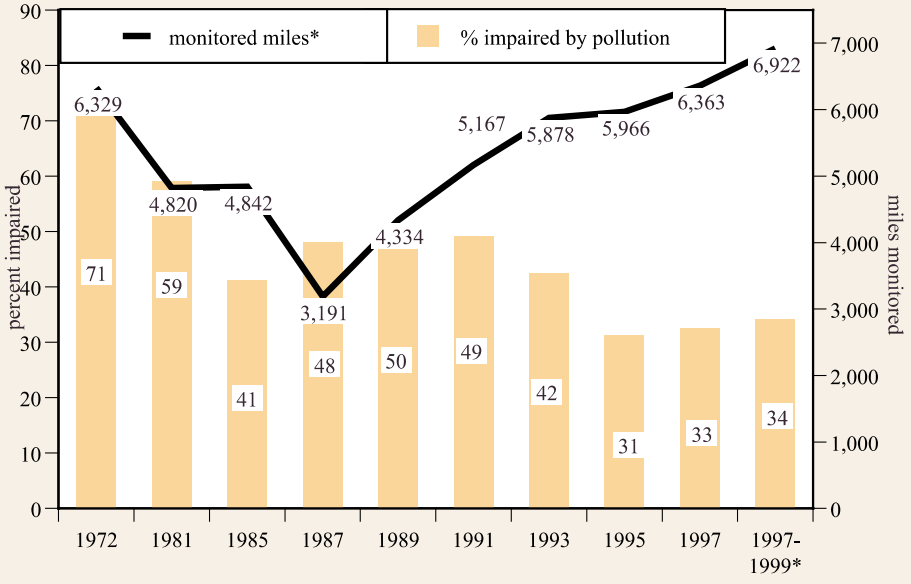
River and stream miles monitored 6,992

Percent of monitored waterways impaired
1972 . . . . . 71%
1989 . . . . . .50%
1995 . . . . . .31%
1997-99. . . . . .34%

Leading sources of water pollution
agriculture 25%
resource extraction 15%
sewage 13%

Leading causes of water pollution
pathogens 31%
siltation 21%
nutrients 10%

Measure 1. Percent of Kentucky Waterways Impaired by Pollution



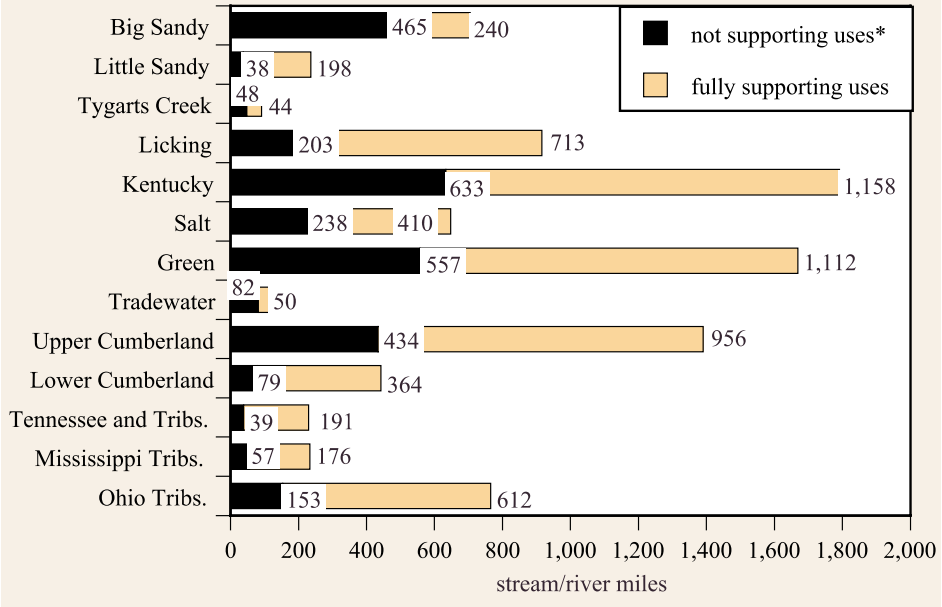
Rivers and Streams

However, trends reveal less progress in restoring water quality in recent years. Since 1995, the percent of impaired waterways has reversed its downward trend and has leveled out. The state is now conducting intensive monitoring on a watershed by watershed basis. This monitoring data may provide a more complete picture of water quality in Kentucky. Each of the state's 11 river basins will be monitored extensively every five years. The intent is to gain a better understanding of overall conditions and pollutants impairing various watersheds, target problems, design effective solutions, and measure success through monitoring and data gathering. Watershed management activities are currently underway in the Kentucky River, Cumberland River and Salt River basins.[2] Intensive monitoring in the Kentucky River Basin during 1998 and 1999 revealed that one-third of the 1,791 miles assessed could not support uses due to pollution.

The Kentucky Division of Water is also required to establish "Total Maximum Daily Loads" or TMDLs for 196 stream segments and 34 lakes that do not meet state water quality standards. In the TMDL process, state and local interests work together to allocate pollution reduction loads among sources and determine the best way to address the specific problems of a particular waterbody. To date, the Division of Water has completed TMDLs on 30 waterways.

Efforts to control pollution from agricultural operations continue. The Kentucky Agriculture Water Quality Act, passed in 1994, requires all farms that are greater than 10 acres in size and that meet the definition of an agricultural operation to develop and implement water quality plans to protect water quality and prevent pollution. To date, 32,592 agriculture operations (36 percent of the state's 91,000 farms) have voluntarily filed plans with state conservation districts.

Measure 2. Stream and River Miles Impaired by Pollution by River Basin (1997-99)

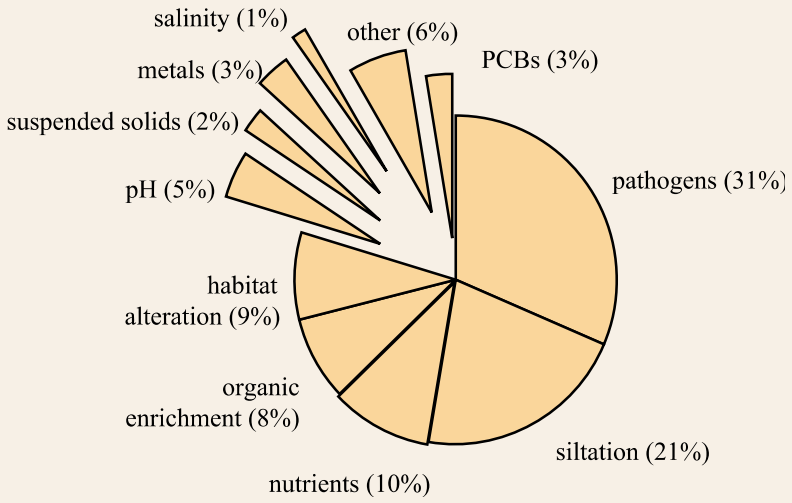


Footnotes

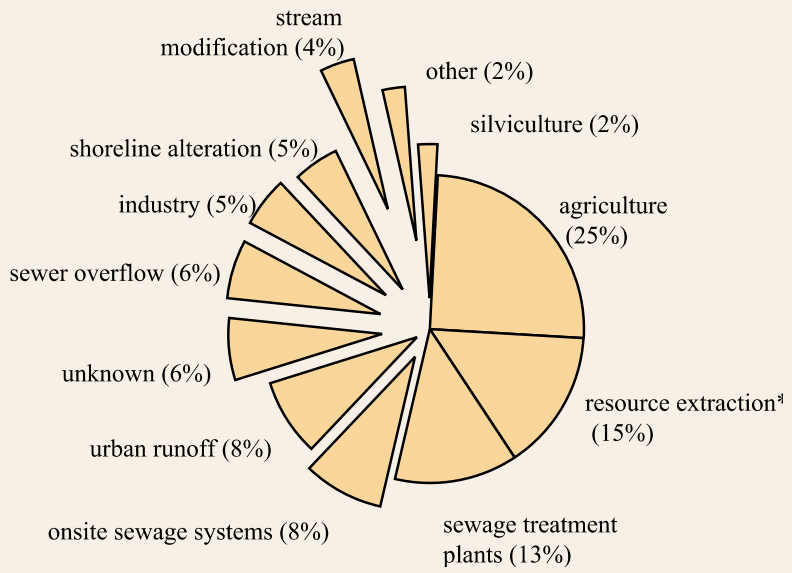
1. There were 44 fixed, statewide stations in the pre-watershed initiative ambient water quality sampling network prior to 1998. This network was increased to 71 in 1998 and was then also supplemented by approximately 25 rotating watershed stations. Most of the 44 (and now 71) stations are located at the downstream end and mid-unit in 8-digit hydrologic units and the downstream end of major tributaries. Their purpose was and is to characterize the water quality of the major watersheds in the state, including long-term trends.

2. More information about the Watershed Framework and TMDL development is available by visiting the Ky. Division of Water's Web site at http://water.nr.state.ky.us/dow/watrshd.htm.

Measure 3. Causes of Stream and River Pollution in Kentucky (1997-99)



Measure 4. Sources of Stream and River Pollution in Kentucky (1997-99)



Measures - notes and sources

***Measure 1**. 1972-1981 data include river and stream miles monitored and evaluated. 1982-1999 based on monitored river and stream miles. Ohio River monitoring data collected by ORSANCO not included. During 1998-99, the Division of Water only monitored waterways in the Kentucky River Basin. *Percent based on 1998-99 monitoring data for the Kentucky River Basin and 1997 monitoring data for the other river basins in Kentucky. Source: Ky. Division of Water.*

***Measure 2**. Based on monitored and evaluated waterways. 1998-99 monitoring data only collected for the Kentucky River. Remaining river basins based on 1997 monitoring data. *Miles not supporting or partially supporting one or more uses (swimming, fishing, drinking water). Source: Ky. Division of Water.*

***Measure 3**. Based on monitored miles. Ohio River monitoring data collected by ORSANCO not included. In 1999 the Division of Water only monitored waterways in the Kentucky River Basin. *Percent based on 1998-99 monitoring data for the Kentucky River Basin and 1997 monitoring data for the other river basins. Source: Ky. Division of Water.*

***Measure 4**. Based on monitored miles. Sources are determined from the data available in geographic information system overlays, including aerial photos and topographic maps of land cover and use, point source discharges and monitoring data, locations of sources and other features that may affect the waters and filed observations. Ohio River monitoring data collected by ORSANCO not included in this chart. In 1998-99, the Division of Water only monitored waterways in the Kentucky River Basin. Percent based on 1998-99 monitoring data for the Kentucky River Basin and 1997 monitoring data for the other river basins. *Water pollution from resource extraction activities (petroleum and coal mining). Known sources include 366 miles impaired by coal mining and 33.7 miles impaired by petroleum activities. Coal mining impacts include: surface mining (122 miles), subsurface mining (65 miles), acid mine drainage (90.3 miles), abandoned mining (43.1 miles) and inactive mining (45.6 miles). Source: Ky. Division of Water.*

Lakes

At a Glance

Number of public lakes 2,271

Number of lakes monitored 106
impaired by pollution 40

Leading sources of lake pollution
agriculture 23%
natural 19%
coal mining 10%

Leading causes of lake pollution
nutrients 60%
organic enrichment.30%
pH. 7%

Indicator 2. Water Quality of Lakes

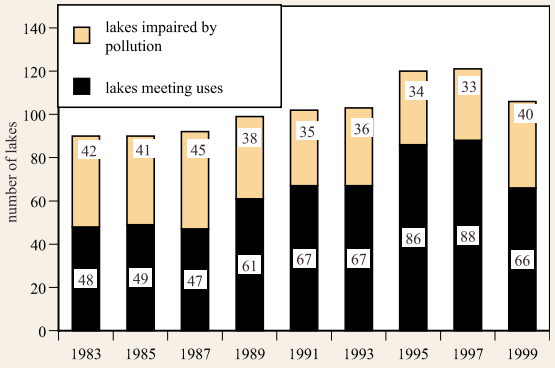
Background Thousands of lakes provide Kentuckians with recreational and economic benefits and supply a number communities with primary and secondary sources of drinking water. The Kentucky Division of Water estimates there are 2,271 lakes in the state, of which 953 are greater than 10 acres in size.

The Kentucky Division of Water monitors most publicly owned lakes every five to seven years. Publicly owned lakes are owned or managed by a city, county, state or federal agency. During 1999, the number of lakes monitored declined by 15 because these domestic water supply lakes were sampled only once in 1997 as part of the state's drinking water program and are not part of the normal lakes monitoring program.

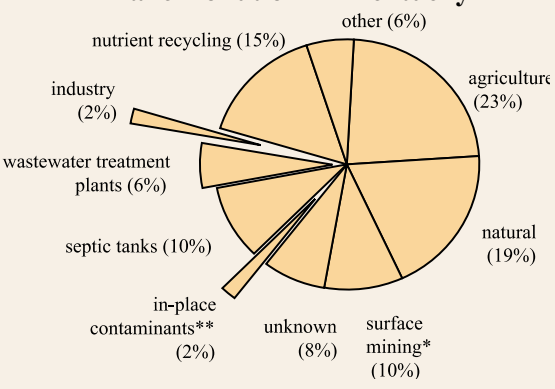
The principal pollutants impairing lake water quality are pesticides and nutrients. Agriculture remains the leading source of lake pollution in Kentucky, polluting 17 of the 40 lakes impaired. Natural conditions, such as shallow lake basins, are impairing the water quality of 10 lakes, followed by nutrient recycling with eight impaired lakes, and coal mining causing five lakes not to meet their designated uses.

Goal Safeguard from pollution the uncontaminated waters of the Commonwealth; prevent the creation of any new pollution of the waters of the Commonwealth; and abate any existing pollution per KRS 224.70-100.

Measure 1. Public Lakes in Kentucky Impaired by Pollution



Measure 2. Sources of Lake Pollution in Kentucky



Progress During the past several years, trends reveal general improvement in the number of monitored public lakes meeting their designated uses for swimming, fishing or as a drinking water source. However, in 1999, Kentucky lost ground. Seven lakes were added to the list of impaired waterways, bringing the total up to 40. One of three public lakes assessed during 1999 was impaired by pollution.

One explanation for the rise in lake pollution may be the drought of 1998 and 1999. The lack of rainfall affected water quality of several lakes resulting in higher water temperature, less aeration, and more extensive phytoplankton communities and blue-green algae. The algae blooms are evident as green coloration of the water and mats of "scum" in mid- to late summer. The eventual die-off of these blooms can also cause low dissolved oxygen levels as bacteria consume oxygen to break down the decaying organic matter. Low dissolved oxygen levels stress fish and other aquatic life and can result in fish kills. Lakes in the Salt and Licking River watersheds were severely impacted by the drought.

But water quality improvements were seen at Reformatory Lake in Oldham County. This lake has been routinely listed as not supporting uses since 1980. The lack of rainfall prevented feedlot nutrients and agriculture runoff pollution from a nearby prison farm from entering the lake, thus improving water quality conditions.

Measures - notes and sources

***Measure 1**. Source: Ky. Division of Water.*

***Measure 2**. Based on 40 public lakes assessed not fully meeting or only partially meeting tier designated uses due to pollution. Some lakes have multiple sources of pollution which are reflected in this chart. *Active, inactive and abandoned coal mines. **Chemicals (PCBs, metals) of unknown origin found in sediment. Source: Ky. Division of Water.*

Indicator 3. Groundwater Quality

Background Groundwater is a valuable resource in Kentucky. During 1999, public water systems (those permitted to withdraw 100,000 gallons per day or more) withdrew 67 million gallons of groundwater a day to meet drinking water needs. Thousands of Kentuckians also depend on groundwater for private drinking water supplies. Since 1990, 17,620 domestic drinking water wells have been reported drilled in Kentucky. Private water wells are most numerous in eastern Kentucky and in far western Kentucky, where 65 percent of all new wells have been constructed in the state. In addition, millions of gallons of groundwater are withdrawn by businesses, industries and farmers to meet their water supply needs. Groundwater also contributes significantly to surface water flow and quality.

The Kentucky Division of Water considers groundwater quality generally good in Kentucky. However, groundwater pollution incidents have been reported in almost every county of the Commonwealth. Impacts on groundwater quality occur more frequently in the most environmentally sensitive karst areas of the state and from a range of activities including spills, leaking underground storage tanks, waste sites, agriculture runoff and untreated sewage. Groundwater contamination is often difficult, and sometimes impossible, to clean up.

Goal Safeguard from pollution the uncontaminated waters of the Commonwealth; prevent the creation of any new pollution of the waters of the Commonwealth; and abate any existing pollution per KRS 224.70-100.

Progress The Kentucky Division of Water established a statewide Ambient Groundwater Monitoring Program in 1995. The network was created to generally determine the quality of groundwater in Kentucky. To date, more than 260 wells and springs have been sampled, ranging from six times a year to one-time-only sampling. Samples are analyzed for more than 200 chemical and physical parameters including nutrients, total and dissolved metals, major inorganic ions, residues, volatile organic compounds and several pesticides, including atrazine, alachlor, metolachlor, simazine and cyanazine.

Various pesticides have been detected in springs and wells sampled in the Ambient Groundwater Monitoring Network. For example, atrazine, a commonly used herbicide in corn production, has been detected in 31 percent of springs sampled, with 1.34 percent exceeding the drinking water standard. Atrazine has also been detected in 7.4 percent of well samples, with 2.8 percent exceeding the drinking water standard.

Some of the chemicals detected in groundwater are naturally occurring. For example, fluoride is an element naturally found in water, soil, minerals, vegetation and foods. It is also found in the human body in structures such as bone and teeth. It has been shown that in communities where fluoride is naturally occurring in the water supply can make teeth stronger and more resistant to tooth decay. However, at high levels fluoride can have a detrimental effect resulting in bone disease, including pain and tenderness of the bones. The U.S. EPA has set an enforceable drinking water standard for fluoride of 4 milligram per liter. In Kentucky, less than 1 percent of the wells and springs tested had fluoride levels above the drinking water standard.

Nitrates also occur naturally through the decomposition of organic matter in soil. Nitrates and nitrites are also major constituents of

Measure 1. Sources of Groundwater Contamination in Kentucky

- Animal Feedlots
- Fertilizer Applications
- Landfills
- Mining and Mine Drainage
- Pesticide Applications
- Septic Systems
- Spills
- Underground Storage Tanks
- Urban Runoff

At a Glance

Withdraw of groundwater for public drinking water (1999)
. . 67 million gallons/day

Number of drinking water wells drilled in Kentucky
1990-1999 17,620

Number of springs and wells in groundwater monitoring network. 260

Percent of springs sampled with detects above standards
metolachlor. 5.44%
benzene 2.30%
atrazine 1.34%
nitrates 0.34%
fluoride 0.12%

Percent of wells sampled with detects above standards
nitrates. 4.30%
atrazine 2.80%
fluoride 0.90%
metolachlor 0.88%

Measure 2. Ambient Groundwater Well Testing Program in Kentucky (Selected Parameters)

Parameter	number sites	number samples	percent detects	percent detects above HCL/MCL*
Alachlor				
springs	65	839	4.60%	2.14%
wells	110	451	1.50%	0.66%
Atrazine				
springs	65	1041	32.70%	1.34%
wells	110	589	7.40%	2.80%
Metolachlor				
springs	68	840	18.70%	5.44%
wells	110	451	3.30%	0.88%
Nitrate-N				
springs	67	866	98.10%	0.34%
wells	111	434	84.70%	4.30%
Arsenic**				
public water systems	239	1,249	7.30%	6.2%
Simazine				
springs	64	885	4.90%	1.24%
wells	110	501	0.79%	0
Fluoride				
springs	68	820	99.00%	0.12%
wells	111	443	98.60%	0.90%
Benzene				
springs	21	86	9.30%	2.30%
wells	20	56	7.14%	0
MTBE***				
wells & springs	134	351	4.80%	0

fertilizers and have been used for many years on croplands and lawns. Nitrates contained in fertilizers can pollute surface and groundwater. Consumption of high levels of nitrate contaminated water poses a particular health risk to infants under 6 months of age affecting the blood's ability to carry oxygen. The drinking water standard for nitrate is 10 milligrams per liter. Nitrate was detected above the drinking water standard in less than 1 percent of the springs and 4.3 percent of the wells sampled. The highest nitrate levels in Kentucky have been detected in shallow, hand-dug wells, while the lowest nitrate levels occur in deeper, drilled wells. Improper water well construction and inadequate maintenance can also make these wells more susceptible to nitrate contamination.

Water wells in the eastern and western coalfields often contain high iron, manganese and sulfur levels. Water well users commonly experience strong sulfur smells in their water, iron staining of appliances and laundry, and bacterial growth in the well. The occurrence of iron, manganese and sulfur in wells is also associated with poor water well construction and improper well maintenance.

Several measures have been undertaken to protect groundwater resources in Kentucky. These include regulations requiring facilities that have the potential to pollute groundwater to develop and implement groundwater protection plans by 2003. The Division of Water has reviewed 20 generic and 228 site specific groundwater protection plans. To date, 162 plans have been approved.

Measures - notes and sources

***Measure 1**. Based on best professional judgement by the Ky. Division of Water. Sources not ranked. Source: Ky. Division of Water.*

***Measure 2**. Based on tests conducted between 1995-1999. *Detections above health advisory limit or drinking water maximum contaminant levels. **Based on an assessment of 239 public water supply wells, springs and private wells. Arsenic detects above standard is based on proposed MCL of 0.01 mg/L. ***Data not broken down by wells and springs. Source: Ky. Division of Water.*

Indicator 4. Fish Kills and Fish Consumption Advisories

Background Kentucky's waterways provide habitat to numerous species of plants, animals and fish. But pollution and ecosystem alterations, such as dams and the removal of vegetation along waterways, have impacted several species of aquatic life. For example, 40 percent of the state's 103 native mussels now are considered rare, and 61 species of freshwater fish are considered at risk due to pollution and ecosystem alterations. In 1997-1999, 22 percent of the 8,581 miles of waterways assessed for aquatic life could not fully support or only partially support this use.

Goal Ensure that the waters of the Commonwealth support healthy fish populations and that the fish are safe to eat.

Progress Data reveal a general decline in the number of fish kill incidents in the Commonwealth. The decline may be attributed to better controls to prevent and contain spills and avoid contamination of waterways.

However, in May 2000, a fire at the Wild Turkey Distillery set the record for the number of fish killed from a single spill in Kentucky. The fire at the distillery in Anderson County resulted in the release of 500,000 gallons of bourbon into the Kentucky River. The incident caused a record 227,692 fish to perish. The state estimated the value of the fish at $471,621. The parent company of Wild Turkey Distillery agreed to compensate the state $256,000 to cover the cost of the fish killed due to the incident.

Toxic chemicals are also increasingly being detected in fish tissue as more testing occurs. State health and environmental officials added two new fish consumption advisories in 2000 to the existing six. In April 2000, a fish consumption notice was issued for all waterways and lakes due to low levels of organic mercury found in fish tissue. Women of childbearing age and children six years and under have been advised not to eat more than one meal per week of freshwater fish. A major source of mercury is emissions from coal-fired power plants. The U.S. Environmental Protection Agency has indicated that it plans to draft regulations to limit

At a Glance

Miles of waterways assessed for aquatic life 8,581

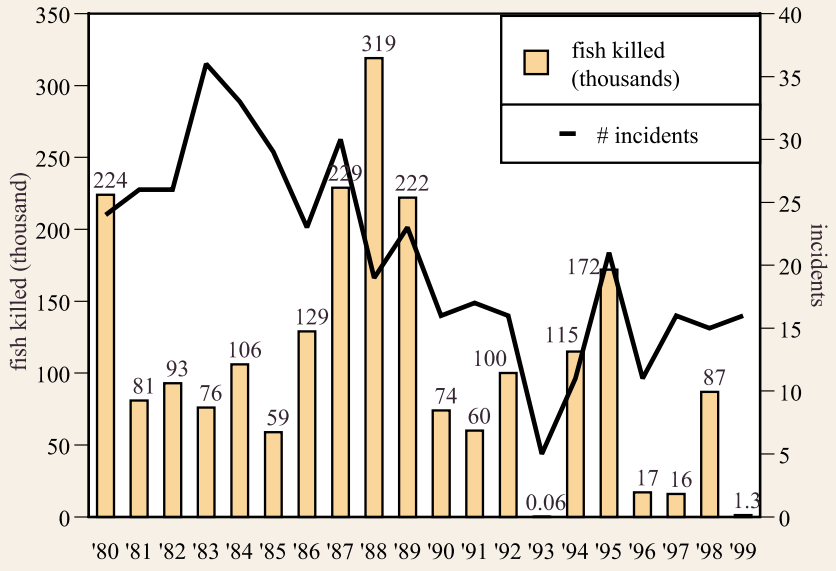
Percent of assessed waterways not or partially supporting aquatic life 22%

Number of fish killed due to pollution incidents in the past ten years 642,360

Number of fish consumption advisories in effect. 8

Pollutants of concern in fish consumption advisories
mercury . . . 3 advisories
pcbs . . . . . 6 advisories

Measure 1. Fish Kill Incidents and Fish Killed in Kentucky



Fish Kills and Advisories

Measure 2. Fish Consumption Advisories in Effect in Kentucky

Stream (counties)	pollutant	year listed	miles	source	fish
Town Br./Mud Rvr. (Logan,Butler,Muhlenberg)	PCBs	1985	71.5	dye-cast plant	all species
West Fork Drakes Creek (Simpson, Warren)	PCBs	1985	46.9	adhesive plant	all species
Little Bayou Creek (McCracken)	PCBs	1985	6.5	gaseous diffusion plant	all species
Ohio River (entire length Ky. border)	PCBs	1989	663.9	industry urban runoff	*
W. Ky. Wildlife Area (McCracken)	mercury	1993	5 ponds	unknown	bass
Green River Lake (Taylor, Adair)	PCBs	1994	entire lake	gas compression station	catfish carp
All waterways	mercury	2000	all	unknown	all species
Metropolis Lake	mercury PCBs	2000	entire lake	unknown	all species

mercury releases from power plants. New requirements are not expected to go into effect until 2004.

In July 2000, a fish advisory was issued for Metropolis Lake in McCracken County because of elevated polychlorinated biphenyls (PCBs) and mercury. The advisory recommends that no more than one meal per month of most fish found in the lake should be eaten. Six fish consumption advisories issued previously remain in effect in Kentucky.

PCBs (probable human carcinogens, according the U.S. Environmental Protection Agency and Centers for Disease Control) and mercury are the contaminants of concern in the fish consumption advisories issued in Kentucky. The Ohio River advisory was modified in 2000 in response to declining levels of PCBs found in paddlefish. Limited consumption of paddlefish is now allowed. In addition, the pesticide chlordane has been removed as a contaminant of concern in the Ohio River fish consumption advisory. Levels of this contaminant have decreased.

Measures - notes and sources

***Measure 1**. Incidents as reported and investigated by the Ky. Department of Fish and Wildlife Resources. Source: Ky. Division of Water, Ky. Department of Fish and Wildlife Resources.*

***Measure 2**. The Ohio River and Mud River advisories are based on Great Lakes Advisory Protocols. Other advisories based on U.S. Federal Drug Administration action level guidelines. *Consumption guidelines providing for limited consumption of paddlefish, carp, channel catfish, smallmouth buffalo, white bass, white crappie, hybrid striped bass, drum, sauger, black bass, channel catfish and blue catfish have been specified by the Ky. Department for Public Health. Source: Ky. Division of Water, Ky. Department for Public Health.*

Indicator 5. Wastewater Treatment

Background In 1999, about 55 percent (2.2 million) of Kentucky's residents, were connected to municipal wastewater treatment systems.[1] Poorly operated and maintained wastewater treatment plants are the fifth leading source of pollution to monitored waterways in Kentucky. The environmental and health implications from the poor operation of these plants can be severe, impairing water quality with disease-causing bacteria, metals and nutrient-laden effluent. In addition to degrading surface water, sewage can migrate into groundwater through the limestone karst underlying almost half of Kentucky.

The number of wastewater plants continues to increase in Kentucky. In 1999, 3,608 wastewater treatment facilities were permitted to operate in the state, an increase of 16 percent since 1997. The greatest increase was in package plants, which now total 1,829. Package treatment plants are prefabricated plants of small capacity. An estimated 60 percent of the Kentucky households are connected to public sewers.

Goal Protect the waters of the Commonwealth by ensuring compliance with state and federal water rules, regulations, permits and enforcement actions.

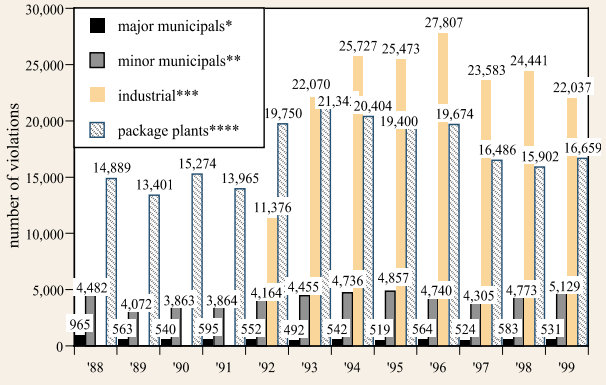
Progress During 1999, 53 percent (1,896 plants) of the 3,608 wastewater plants permitted to operate in Kentucky had one or more violations of water quality regulations. This was improvement since 1997 when 2,048 had violations. A majority of the 44,356 violations cited in 1999 were either monitoring or reporting infractions while 26 percent (11,689 violations), were violations of permit limits set to protect public health and the environment.

Package treatment plants account for 38 percent of the wastewater permit limit violations. Poor maintenance and operation have led the state to target problem plants for removal or regionalization. Between 1995 and 1999, 275 package plants have been deactivated.

Efforts to upgrade and build new municipal wastewater treatment plants continue. Millions of dollars in federal, state, local and private funds have been invested in wastewater treatment. For example, between 1989 and 1999, 119 projects totaling $284 million have been funded through a low-interest state wastewater revolving loan program. But an estimated $3.2 billion is still needed over the next 20 years to meet statewide wastewater construction needs.

A state program to require industries to pretreat their wastewater prior to its discharge to a municipal wastewater treatment plant has assisted in reducing pollutants released to water-

Measure 1. Violation Trends at Wastewater Treatment Plants in Kentucky



At a Glance

Number of households served by waste treatment plants
. . . . . 55%

Number of wastewater treatment plants
1995 3,227
1997 3,089
1999. 3,608

Number of violations cited at plants
1995 50,249
1997. 44,898
1999 44,356

Percent of wastewater treatment plants with violations
1995 . . . . . 60%
1997 . . . . . 66%
1999. . . . . .53%

Plants with violations (by type of plant, 1999)
package plants. . . . 833
minor industrial. . . 807
minor municipal . . . 157
major municipal 51
major industrial 48

Cost to meet wastewater infrastructure construction needs in next 20 years
. . . . . $3.2 billion

Measure 2. Types of Wastewater Treatment Plants and Violations of Regulatory Requirements in Kentucky (1999)

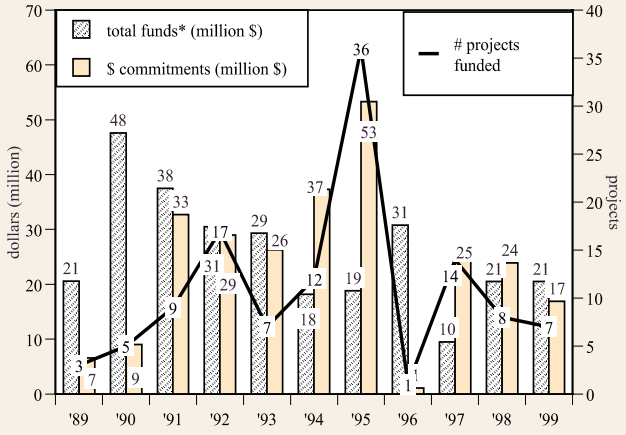
type of plant	number of plants	# of plants in violation	% plants in violation	total violations*	violations of permit limits
Major Municipal	70	51	73%	531	324
Minor Municipal	178	157	88%	5,129	2,164
Major Industrial	58	48	83%	326	234
Minor Industrial	1,473	807	55%	21,711	3,487
Package	1,829	833	46%	16,659	5,480
Total	**3,608**	**1,896**	**53%**	**44,356**	**11,689**

Wastewater Treatment

Measure 3. Wastewater Pretreatment Programs - Number of Industrial Users in Noncompliance in Kentucky

wastewater treatment plant	# industrial users	# in non-compliance
Ashland	5	1
Auburn	1	1
Bardstown	17	3
Beaver Dam	7	1
Bowling Green	24	5
Campbell/Kenton Co.	47	1
Campbellsville	6	1
Carrollton	2	1
Elizabethtown	21	2
Frankfort	15	2
Franklin	10	2
Fulton	3	3
Glasgow	15	2
Harrodsburg	6	3
Lawrenceburg	6	1
Lebanon	8	2
Leitchfield	11	3
Lexington	38	6
London	10	9
Louisville	121	28
Mayfield	6	3
Maysville	6	1
Monticello	3	1
Morehead	6	1
Morganfield	4	2
Mount Sterling	7	3
Owingsville	1	1
Paris	8	1
Princeton	1	1
Richmond	25	2
Russellville	6	1
Shelbyville	14	1
Somerset	29	3
Springfield	5	3
Stanford	2	1
Williamstown	4	1
Winchester	15	4
Total (1999*) 37	**679**	**106**
Total (1997*) 39	**543**	**96**
Total (1996*) 21	**340**	**56**
Total (1994*) 19	**339**	**52**
Total (1992*) 27	**41**	**115**

Measure 4. Kentucky Wastewater Infrastructure Loan Fund



ways. Pretreatment programs are in effect at 679 industrial facilities in 65 cities. During 1999, 106 of the 679 industrial facilities (15.6 percent) were in significant noncompliance with their pretreatment requirements at sometime during the year.

Combined sewer overflows (CSOs) are a problem in older cities where stormwater runoff is carried in sanitary sewer pipes. During storms, the sewers overflow and discharge raw sewage into receiving waters. The Division of Water has identified 17 cities with CSOs and 293 CSO outfall points. Louisville has the greatest number of CSOs at 115. The elimination of CSOs can be costly and in many cases not practical. Only 15 CSOs have been eliminated since 1996. Instead, efforts are being made to control CSOs to prevent discharges.

Footnotes

1. Water Resource Development: A Strategic Plan for Wastewater Treatment, Draft, Kentucky Water Resource Development Commission, April, 2000.

Measures - notes and sources

***Measure 1**. *Major municipals treat 1,000,000 gallons or more per day. **Minor municipals treat less than 1,000,000 gallons per day. ***Industrial facilities treat effluent generated during manufacturing process (data not available prior to 1992). ****Package treatment plants are prefabricated plants of small capacity. Source: Ky. Division of Water.*

***Measure 2**. *Includes permit, monitoring and reporting violations. Source: Ky. Division of Water.*

***Measure 3**. *July-December reporting period. Significant noncompliance as defined by 40 CFR 403.8(f)(2)(vii). Source: Ky. Division of Water.*

***Measure 4**. *Includes federal grants, state match and interest incurred. In 1996, most of the money distributed went to existing projects. Source: Ky. Division of Water.*

Indicator 6. Onsite Sewage Treatment and Disposal

Background An estimated 45 percent of the state's population depend on private package plants, septic systems, artificial wetlands, other systems or have no treatment system for waste disposal.[1] According to the 1990 U.S. Census, about 600,000 housing units, depend upon onsite systems to treat sewage. About 37 percent of new home constructions in the state are now using onsite sewage systems for wastewater treatment, according to the Kentucky Onsite Wastewater Association.

Failing septic systems and illegal straight pipe discharges of sewage from homes and businesses are contributing to pollution problems in a number of Kentucky waterways. While it is not known how many failing septic systems and illegal straight pipes are discharging raw sewage into waterways, it is considered a widespread problem across the state. Onsite sewage disposal is the fourth leading source of water pollution in Kentucky's monitored waterways, according to the Kentucky Division of Water. Close to 4,000 complaints were received by local health officials in 1999 regarding onsite sewage systems. Kentucky leads the nation in the number of rural households without complete plumbing, according to the Rural Community Assistance Program.[2]

Goal Protect the waters of the Commonwealth through the proper construction, installation and alteration of onsite sewage disposal systems (KRS 211.350).

Progress Each year, thousands of onsite septic system permits are issued by local health departments. During fiscal year 1999-00, more than 22,000 onsite sewage permits were issued, double the number just five years ago. The increase in the number of permits is attributed, in part, to Senate Bill 18 passed by the 1998 General Assembly. The law prohibits the connection of electricity to a new residence unless the owner has an approved plan to install adequate sewage-disposal facilities.

In 1998, a $4 million grant from the U.S. Department of Commerce was awarded to a 40-county area along the Kentucky River to address existing septic tank problems. The grant established a revolving loan fund to provide low-interest loans to homeowners who have straight pipe sewer lines or failing septic tanks. To date, $6 million in loans has been distributed to 2,369 households for septic systems or sewage line hookups as part of the program.

In May 1999, the Environmental Quality Commission (EQC) embarked on a project to assess onsite sewage issues and policy needs in Kentucky. EQC conducted more than 30 interviews and surveyed county health departments to identify onsite sewage issues and policy needs. On Sept. 23, 1999, EQC convened a roundtable discussion of 37 individuals to review various onsite policy options. EQC issued seven key and nine additional recommendations based on its findings.

In response to the recommendations, the Kentucky Division of Water and the Kentucky Department for Public Health are developing an Onsite/Decentralized Wastewater Action Plan. The plan will focus on education, watershed-based remediation planning, funding, onsite/decentralized sewage management and regulatory changes.

At a Glance

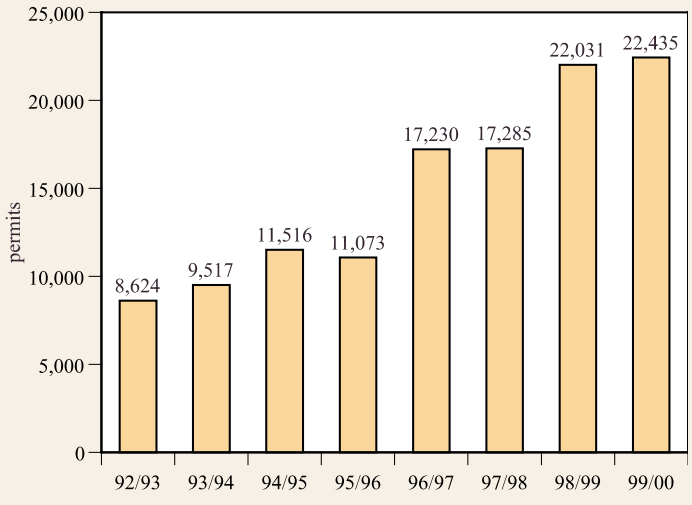
Number of households depending upon onsite sewage systems . . 45%

Number of onsite sewage permits
1995 11,073
1998 22,031
1999 22,435

Extent of water pollution caused by onsite sewage
. . . . 4th leading source

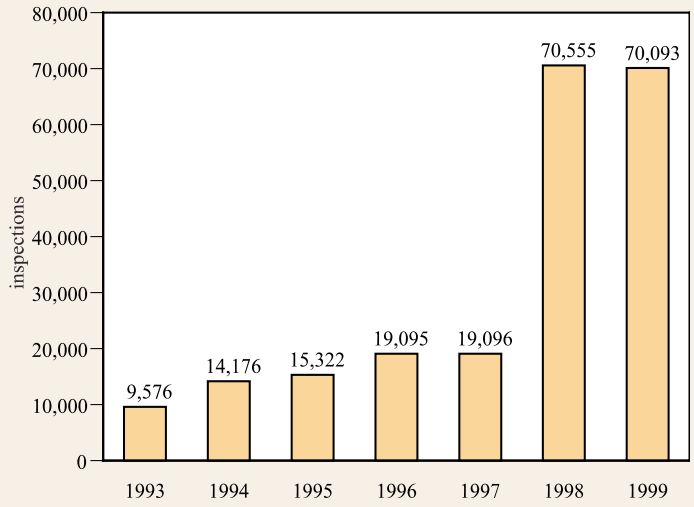
Onsite sewage complaints
1995. 3,326
1998. 5,008
1999. 3,960

Measure 1. Onsite Sewage Disposal Permits Issued in Kentucky

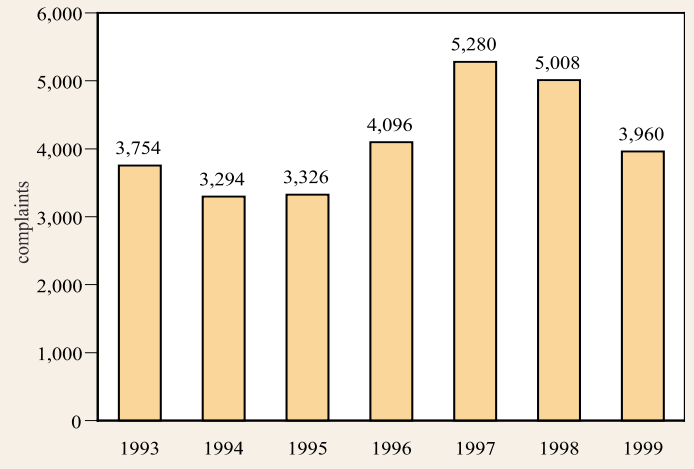


Onsite Sewage

Measure 2. Onsite Sewage Inspection Trends in Kentucky



Measure 3. Onsite Sewage Complaint Trends in Kentucky



Some rural electric cooperatives have expressed an interest in helping communities manage onsite sewage systems. Several demonstration projects are underway, including one in the community of Preston in Bath County. The Rural Electric Cooperative will manage, operate and maintain the effluent collection system, lagoon treatment and subsurface disposal systems of 110 homes.

State legislation was also passed in 1998 to address discharges of untreated sewage from houseboats. The law required all houseboats with marine toilets to have sanitation devices to treat or store wastewater and all marinas to have sewage pumpout stations by July 15, 2000. The state water patrol has initiated measures to educate houseboat owners and marinas about the law. Water patrol officials report they plan to begin enforcing the houseboat law in the spring of 2001.

Footnotes

***1**. Water Resource Development: A Strategic Plan for Wastewater Treatment, Draft, Water Resource Development Commission, April 2000.*
***2**. Still Living Without the Basics, Rural Community Assistance Program, 1996.*

Measures - notes and sources

***Measure 1**. Based on state fiscal year. Data on septic tank permits prior to 1992-93 not available. Source: Ky. Department for Public Health.*
***Measure 2**. Source: Ky. Department for Public Health.*
***Measure 3**. The increase in inspections during 1998 and 1999 is attributed to Senate Bill 18, improvements in the data collection system, and more accurate and standardized reporting by local health inspectors. Source: Ky. Department for Public Health.*

WATER RESOURCES

Indicator 7. Enforcement and Compliance

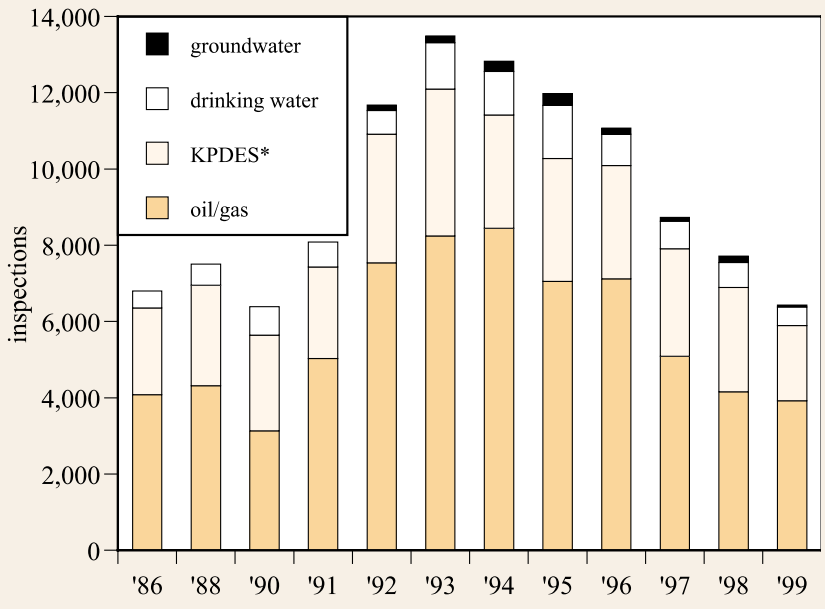
Background State efforts to restore water quality have historically emphasized the control of industrial and municipal discharges into waterways. Under the federal Clean Water Act of 1972 and state law, the discharge of pollutants into the waters of the Commonwealth is prohibited unless a Kentucky Pollutant Discharge Elimination System (KPDES) permit is issued. These permits limit the amount of pollutants discharged, require monitoring of discharges, and must be renewed every five years. During the past decade, the Kentucky Division of Water has focused additional attention on addressing other sources of water pollution including polluted runoff from agriculture, timber and construction operations and urban areas.

Goal Protect the waters of the Commonwealth by ensuring compliance with water rules, regulations, permits and enforcement actions.

Progress Many water quality improvements witnessed during the past several years have been the result of the enforcement of Clean Water Act rules. Businesses, industries, wastewater treatment plants, oil and gas operations, agricultural operations and other activities are inspected for compliance with state water quality permits and regulations. Trends reveal that Kentucky Division of Water inspections hit an all-time high in 1993, totaling 13,490. Inspections have since declined and in 1999 reached their lowest levels (6,174) since EQC began tracking this indicator.

The decline of inspections during 1999 is attributed to a combination of factors, including efforts to assist communities during 1999 drought, targeted enforcement of open dumpers, and surveys of animal feeding operations. The division reports that close to 1,300 surveys were conducted to identify poultry, hog and other confined animal feeding operations. The surveys were in response to new state requirements to address environmental problems associated with such operations. The division also reports that the drop in inspections may be attributed to staff turnover.

Measure 1. Water Quality Inspection Trends in Kentucky



ENFORCEMENT AND COMPLIANCE

At a Glance

Number of water permits (coal, industrial and municipal facilities). 7,197

Water permits for oil and gas operations 10,912

Inspections
1995. 11,978
1997 8,740
1999 6,174

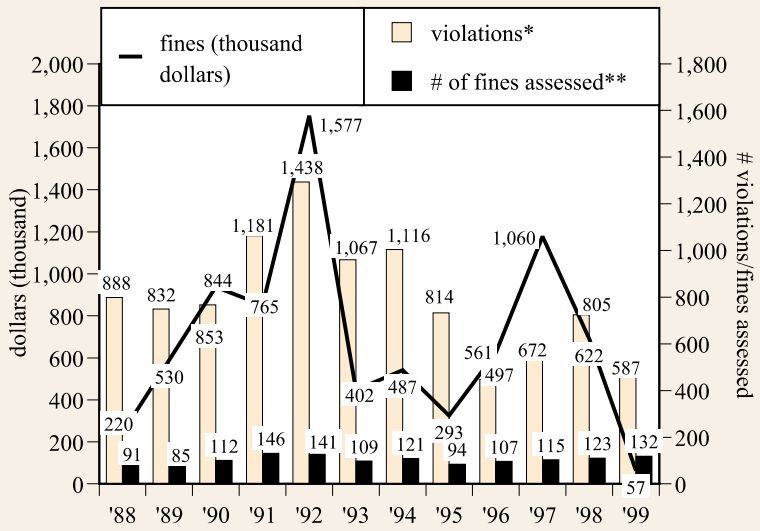
Violations
1995 814
1997 672
1999 587

Percent of major facilities in significant noncompliance with effluent discharge limits
1997. . . . . .11%
2000 . . . . . 14%

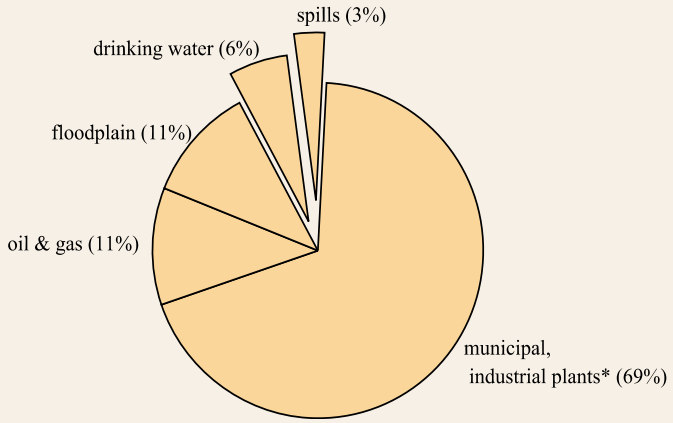
Complaints
1995 2,358
1997 3,073
1999 2,934

Enforcement and Compliance

Measure 2. Water Quality Violation and Penalty Trends in Kentucky



Measure 3. Water Quality Violations by Type in Kentucky



Water inspectors also respond to citizen complaints. Nearly 25 percent of the 2,934 complaints in 1999 concerned sewage.

Industrial and municipal facilities were the most frequent violators of clean water rules during 1999, accounting for 69 percent of the 587 violations cited by field inspectors. In addition, the Kentucky Division of Water's Permit Branch reports that in 1999, 16 of the 125 major facility water permits were in significant noncompliance (SNC) for failure to report required monitoring results or for effluent discharges above permitted limits.

Most violations are resolved through agreed orders or other means. However, some of the more serious infractions result in fines. During 1999, $57,000 in penalties were assessed against 122 entities, 87 of which were permitted facilities.

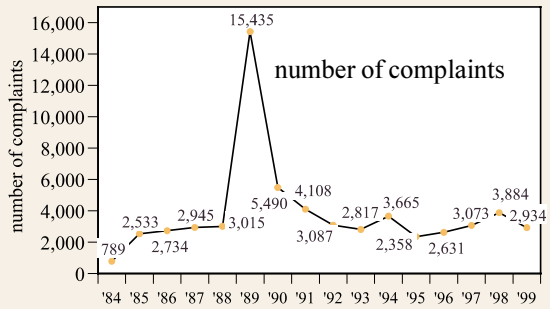
Measures - notes and sources

Measure 1. **Facilities with Ky. Pollution Discharge Elimination System (KPDES) Permits. Does not include inspections at KPDES permitted coal mines which are conducted by the Ky. Department of Surface Mining Reclamation and Enforcement. Does not include complaint and open dump investigations. Source: Ky. Division of Water.*

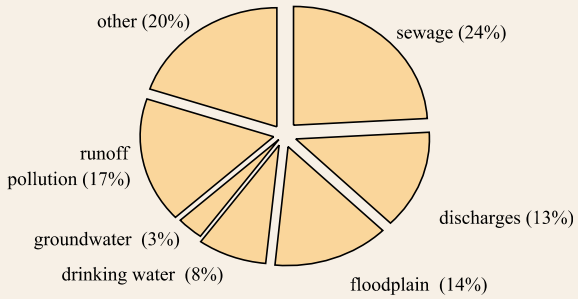
Measure 2. *Does not include coal mining water violations and penalties. *Violations cited by field inspectors. **Penalties assessed by the Ky. Division of Water, Enforcement Branch (does not include drinking water or federal government penalty assessments). Source: Ky. Division of Water.*

Measure 3. *Based on 587 violations cited by Division of Water field inspectors in 1999. Does not include coal mining water violations and penalties. *KPDES discharges (Data not available by individual sources such as municipal or industrial facilities). Source: Ky. Division of Water.*

Measure 4. Number and Types of Water Quality Complaints in Kentucky



Types of Complaints



Measure 4. *Data include only complaints received by the Ky. Division of Water. The increased number of complaints reported for 1989 is attributed to public concerns about the Jamestown/ Union Underwear discharge to Lake Cumberland/Lily Creek. Source: Ky. Division of Water.*

Measure 5. *STP - sewage treatment plant. Significant noncompliance is defined as those facilities with two to four exceedances of permit limits in a six-month period. Major facilities currently include 69 major municipal wastewater treatment plants, 51 industrial and 4 federal facilities that treat one million gallons or more per day. Source: Ky. Division of Water.*

Measure 5. Major KPDES Facilities in Significant Noncompliance (1999)

Facility	County
Paris STP	Bourbon
AK Steel Corp. Coke Plant	Boyd
Cattlettsburg Refining LLC	Boyd
Murray STP	Calloway
Lancaster STP	Garrard
Arvin Roll Coater Inc.	Hancock
Commonwealth Aluminum	Hancock
NSA Div. of Southwire Co.	Hancock
Ky. Power Co. Big Sandy	Lawrence
London STP	Laurel
Westlake CA&O Corp.	Marshall
ISP Chemicals	Marshall
Maysville STP	Mason
Bardstown STP	Nelson
Western Ky. Energy Wilson	Ohio
Somerset STP	Pulaski